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ABSTRACT

The course-taking behavior of various types of students pursuing undergraduate professional programs was examined, and an attempt was made to demonstrate some analytical procedures that can be applied in studying course-taking behavior. Course-taking behavior was defined as the average credit hour load of a student as distributed across the program course offerings of the institutions. The basic study question was to determine what influences, if any, student characteristics have on course selection patterns. The influence of the following student characteristics were assessed: sex, minority group status, full-time versus part-time student status, and level of the student. Additionally, the school and department in which the student was enrolled were considered. University of Pittsburgh undergraduate professional school students were studied: 4,413 in the fall term and 4,374 in the winter term. Among the findings were the following: of the six schools, only that of social work and health-related professions did not identify sex or race as influences on course-taking behavior; all schools showed that a difference existed between part-time and full-time students relative to the courses selected; and course-taking behavior (course election patterns) was differentiated among levels of undergraduates. A methodology for analyzing course-taking behavior, which includes use of multivariate analysis of variance and discriminant analysis, is considered. (SW)

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DIFFERENCES ASSOCIATED WITH SELECTED UNDERGRADUATE STUDENT CHARACTERISTICS IN THE DEMAND FOR ACADEMIC PROGRAMS

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APPENDIX

DIFFERENCES ASSOCIATED WITH SELECTED UNDERGRADUATE STUDENT CHARACTERISTICS IN THE DEMAND FOR ACADEMIC PROGRAMS

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Since the early 1970s, an increasing number of higher education institutions have begun to develop institutional planning systems to assess more effectively the multitude of external factors impacting upon the institution and to provide a framework that will permit the institution to define and pursue its stated mission and goals. Planning in institutions of higher education typically has focused attention on the resource aspects of these institutions: budgets, enrollments, and physical plant. Only recently has attention been given to academic planning. While the confluence of pressures and demands confronting these institutions during the last decade has greatly influenced these particular foci of planning interests, academic planning must serve as the central focus for institutional planning. In the coming decade, academic planning will be increasingly concerned with the development, implementation, and evaluation of programs in relationship to external needs and the basic mission of the institution. One major component of this linkage between changing external needs and demands and academic programs is represented by students and the behaviors they manifest in selecting academic programs of study and distribution of courses.

Enrollment projections of the f coming decade project a demographic decline in undergraduat . These proj ction n, and higher education institutions have begun to develop plans esp to this trend, but what remains uncertain is the demand the composition of future student bodies will have on program offerings. The composition of the current student body is becoming quite different from the traditional college student population. This change is partially the result of a major public policy emphasis of the 1960s and 1970s that has had a significant impact on the characteristics of the student body. This policy to improve student access to higher education has been implemented through increases in various federal and state student aid programs that have resulted in large increases in the number of students attending institutions of higher education. This, coupled with changing public attitudes, has provided increased opportunities for minority groups, especially blacks, and for women. The opportunity to obtain a college degree has been and will remain a key ingredient in achieving social equity.

Trends in undergraduate college enrollments have reflected the success of this policy orientation. Not only have numbers increased, but a change in the composition of the student body has also occurred. As shown on the annual American Council for Education surveys, in 1966, 91% of the freshman class in four year institutions of higher education were white, and by 1977 this percentage had dropped to 87%. Similarly, higher education for women has increased over the last decade. In 1966, 40% of all fall term enrollments in four-year institutions were accounted for by women. In the fall term of 1979, for the first time, the number of women enrolled (5.9 million) exceeded the number of men (5.7 million). Another major trend influencing the composition of undergraduate enrollments in higher education is that more students are electing to attend on a part-time rather than full-time basis. Data reported by the National Center for Educational Statistics show that across all colleges and universities, part-time enrollments in the fall of 1979 reflected a higher percentage increase from the 1977 fall term, 6.3%, than did full-time enrollments, 0.1%. A large portion of this increase was attributable to women enrolling on a part-time basis. As is evident, participation rates of various student clienteles have shifted with more minority and women students tending to enroll and students overall attending increasingly on a part-time basis. These general trends are expected to continue into the 1980s.

Institutions of higher education have responded, and will continue to respond, to these changing conditions. For example, many institutions have initiated recruitment efforts to attract new types of students, as well as developed a variety of new specialized programs, many of which emphasize professional undergraduate study. Yet the full impact of these new students on the programs and course offerings of an institution are relatively unknown, and little has been done to determine whether or not differences exist in the types of programs and courses that these new students are selecting as opposed to the more traditional student.

The focus of this study is (1) to examine the course taking behavior of various types of students pursuing undergraduate professional programs and (2) to demonstrate some analytical procedures that can be applied in studying course taking behavior. In this instance, course taking behavior is defined as the average credit hour load of a student as it is distributed across the program course offerings of the institution. The basic question is, "What influences, if any, do student characteristics have on course selection patterns?"

(1) Do women select a different distribution of program offerings than men?

(2) Does the pattern of course selection for minority students differ from white students?

(3) Is there a difference between full- and part-time students in their respective course taking pattern?

(4) Do differences exist among freshmen, sophomores, juniors, and seniors? If differences in the average course taking behavior can be identified as being related to selected student characteristics and if enrollment projections indicate specific shifts in the composition of the student body, institutions of higher education can begin to plan for such changes and to align resources, faculty, and facilities with the projected shifts in program demand.

Definition of Terms

Five student characteristics are of interest in this study.

1. Sex -- genetic sex.
   a. male
   b. female
2. Race -- racial background of students based on EEO 6 categories.
   a. white
   b. minority which includes Black, Asian or Pacific Islander, American Indian or Native Alaskan, and Hispanic
3. Status -- the basis on which a student enrolls for a given term.
   a. full-time undergraduate students who enroll for 12 or more credits
   b. part-time undergraduate students who enroll for less than 12 credits
4. Level -- indicator of progress toward degree completion.
   a. freshman with up to 25% of the credits required for the respective degree
   b. sophomore with up to 50% of the credits required for the respective degree

c. junior with up to 75% of the credits required for the respective degree

d. senior with up to 100% of the credits required for the respective degree

5. Major -- degree program of the student indicated by general HEGIS categories.

Further, the course taking behavior of the students can be reflected in terms of three characteristics.

1. School -- the school offering the course being taken.
2. Department -- the department within the school offering the course being taken.
3. Course level -- the level of the course being offered.
   a. lower level undergraduate courses designed for freshman or sophomore majors
   b. upper level undergraduate courses designed for juniors or senior majors
   c. graduate courses designed for graduate majors

Sample

The course election patterns of selected students enrolled in underg aduate professional schools at the Pittsburgh Campus of the University of Pittsburgh who attended both the fall and winter terms of a recent academic year were exami . The sample was selected from undergraduate enrollment pools available for these terms, a total of 4,413 in the fall term and 4,374 in the winter term. One criterion for sample inclusion was attendance in both terms and was adopted so that individuals who enrolled sporadically or who had left the University would not be included. Further, only those students classified

as freshmen, sophomores, juniors, or seniors were included; those undergraduate students enrolling in certificate programs or with non-degree status were excluded. Finally, students were selected who had declared a major area of study in one of the following schools: the School of Engineering, the School of Health Related Professions, the School of Nursing, the School of Pharmacy, and the School of Social Work. Not included in this study were the University's undergraduate liberal arts and evening degree schools. The concern was to identify that group of degree-seeking, undergraduate students which reflected a consistent pattern of attendance. Comparisons of the sample with the total population for each term showed similar distributions on the student characteristics of sex, race, and level. Only for the enrolling status variable were differences noted; a higher percentage of full-time students was sampled. The difference, however, is consistent wi .iterion for selection so that the part-time students selected, althoug. representing a .ier percentage than in the total undergraduate population, reflected a stable attendance pattern.

Analysis and Results

Since the University has broad undergraduate professional program offerings, independent analyses were conducted for each of six schools: Education, Engineering, Health Related Professions, Nursing, Pharmacy, and Social Work. Analysis of the course taking behavior of students involved three approaches. (1) Descriptive statistics summarizing the characteristics of the student body within each respective school were computed. (2) Multivariate analysis of variance tests of hypotheses focusing on the independent variables of sex, race, status, and level were conducted. (3) Discriminant analyses were performed to assess the relative contribution of the various components of the students' course taking behavior to the discrimination of the groups to be tested. While information has been obtained and analyzed for all six schools, for the purposes of this paper, only selected information collected and analyzed for the School of Engineering will be presented for discussion.

Characteristics of the Student Body

Table 1 summarizes for the six schools under consideration the percentage distributions of the respective student bodies by sex, race, status, and level.

Sex. As would be expected, the School of the Health Related Professions, Nursing, and Social Work, had a high percentage of female undergraduate students, while Engineering had a highly male enrollment. In Education about one-third of the enrollment was female, while Pharmacy had a more balanced percentage of male and female students.

Race. In Education and Social Work, the racial composition of the schools approximated parity with the general population in regard to minority enrollments. In the remaining schools, however, the racial composition was predominantly white.

Status. Students in Engineering, Health Related Professions, Nursing, and Pharmacy tended to enroll as full-time students. In Education and Social Work, larger percentages of students attended on a part-time basis than in the other schools, although the majority of students attended on a full-time basis.

Level. Certain schools also were primarily for upper level majors, including Education, Health Related Professions, Pharmacy, and Social Work. Both Engineering and Nursing tended to have a more uniform distribution across the student levels.

Influence of Sex, Race, Status, and Level on Course Taking Behavior

The distribution of course work of student majors has been of interest to those in higher education. For example, the National Center for Higher

Table 1

Underg[illegible]luat[illegible] Student Characteristics by School for the Fall

	Schools					
	Education	Engineering	Health Related Professions	Nursing	Pharmacy	Social Worl
otal Number	425	1,965	312	609	400	152
ex						
Male						
No.	151	1,658	45	16	220	23
%	36%	84%	14%	3%	55%	15%
Female						
No.	274	307	267	593	180	129
%	64%	16%	86%	97%	45%	85%
ace						
Minority						
No.	52	134	20	23	12	28
%	12%	7%	6%	4%	3%	18%
White						
No.	373	1,831	292	586	388	124
%	88%	93%	94%	96%	97%	82%
atus						
Full-Time						
No.	302	1,791	274	557	396	128
%	71%	91%	88%	91%	99%	84%
Part-Time						
No.	123	174	38	52	4	24
%	29%	9%	12%	9%	1%	16%
vel						
Freshman						
No.	76	439	11	131	27	1
%	18%	22%	4%	21%	7%	1%
Sophomore						
No.	65	492	9	155	107	4
%	15%	25%	3%	25%	27%	3%
Junior						
No.	118	529	114	154	149	9
%	28%	27%	37%	25%	37%	60%
Senior						
No.	166	505	178	169	117	56
%	39%	26%	57%	28%	29%	37%

Education Management Systems has recommended in its cost exchange procedures that costs of teaching courses be distributed across student majors so that the cost per major can be determined more accurately. In addition, NCHEMS' major planning tool, the Resource Requirements Prediction Model, utilizes the pattern of course taking behavior as the major component for projecting resources. The basic mechanism for summarizing course taking behavior is known as an induced work load matrix (IWLM). The columns of this matrix describe for each student major the average number of credits taken over a given period of time, while the rows show how this average credit load is distributed across the course offering programs of the institution.

Table 2 shows, as an example, the average number of credits taken by Engineering undergraduate students in the fall term being examined. The areas offering courses are displayed in terms of the school, department, and level. From this descriptive summary, Engineering students appear, on the average, to take most of their courses in Engineering at the lower and upper undergraduate levels, with other courses primarily being selected from the natural sciences, computer science, mathematics, and physical sciences.

This analysis of course taking behavior, which is the most often used, does not in and of itself adequately address the questions raised about the influences of student characteristics as sex, race, enrolling status, and level. To study these factors and their influence on student course taking behavior, a multivariate analysis of variance approach was taken, with the column of the IWLM representing the dependent variables. Since the schools substantially differed from each other on the four student characteristics being examined and in the patterns of course taking behavior, separate multivariate models of analysis were developed for each school. For all schools,

Table 2

Average Number of Credits Taken by Engineering Students

Variable			Average Credits Taken
Department	School	Level	N = 1965
BIOL	NAT SC	LL	0.035
BIOL	NAT SC	UL	0.002
BUSIN	GEN ST	LL	0.004
BUSIN	CAS	UL	0.185
COMPR	NAT SC	LL	0.093
COMPR	NAT SC	UL	0.021
EDUC	GEN ST	LL	0.003
EDUC	CAS	LL	0.021
ENGRN	ENGRNG	LL	4.299
ENGRN	ENGRNG	GR	0.267
ENGRN	ENGRNG	UL	5.227
ARTS	HUMNTS	LL	0.027
ARTS	HUMNTS	UL	0.008
ARTS	GEN ST	LL	0.004
LANG	HUMNTS	LL	0.015
LETTR	HUMNTS	LL	0.113
LETTR	HUMNTS	UL	0.039
LETTR	GEN ST	LL	0.002
LETTR	CAS	LL	0.160
MATH	NAT SC	LL	0.106
MATH	NAT SC	GR	0.002
MATH	NAT SC	UL	0.031
MLTRY	ROTC	LL	0.088
MLTRY	ROTC	UL	0.060
PHY S	NAT SC	LL	3.329
PHY S	NAT SC	UL	0.018
PSYCH	NAT SC	LL	0.009
PUB A	GEN ST	LL	0.009
SOC S	SOC SC	LL	0.940
SOC S	SOC SC	UL	0.060
SOC S	CAS	LL	0.012
SOC S	CAS	UL	0.006
INTRD	HUMNTS	LL	0.011
INTRD	HUMNTS	UL	0.006
INTRD	CAS	LL	0.013
CERT	GEN ST	UL	0.006

the main effects of sex, race, status, and level were included. Because of the small cell sizes or empty cells necessarily produced by the distribution of student characteristics, second order and higher interactions were not included in any of the analyses. Inclusion of first order interactions in the model for a given school was contingent again on the cell frequency. At least 2% of the sample had to occur in each cell involved in the hypothesized contrasts in order for the interaction to be included in the model. Summaries of the multivariate analyses of variance are provided in Appendix A.

As shown in Table 3, each of the six schools has its own particular pattern of significant student characteristics. This table presents a summary of those significant (*) student characteristics (= 0.01 level); also indicated (0) are those hypotheses that were omitted from analysis because of an insufficient number of students in the particular groups being compared. In Social Work, with only one exception, no differences in course taking behavior relative to the student characteristics studied could be observed. In Nursing, Engineering, and Pharmacy, with only a few exceptions, significant differences were observed across all student characteristics examined. For Education and Health Related Professions, the influence of student characteristics on course taking behavior is mixed. From the perspective of the student characteristics, status and level appear to be consistent factors which differentiate course taking behavior, with the exception of Social Work. Sex and race also seem to be an important factor in most schools, although in two schools they are not. With regard to the interactions examined, the influence of these factors is not consistent for those hypothesis tested.

While a test of hypothesis indicates that statistical differences exist among the groups being contrasted, this information provides only an indication

Table 3

Multivariate Analysis of Variance
Summary of Significant Tests of Hypotheses
by School

Hypothesis	Education	Engineering	Health Related Professions	Nursing	Pharmacy	Social Work
Sex	*	*	0	*	*	0
Race	*	*	0	*	*	0
Status	*	*	*	*	*	*
Level	*	*	*	*	*	0
Sex x Race	*	*				0
Sex x Status	0		0			0
Sex x Level	0	*			0	
Race x Status	0					0
Race x Level	0	0				
Status x Level	*		0	*		

*: Statistically significant

= 0.01

0: Not statistically significant

A blank indicates the analysis was not done because of too few observations.

as to the educational relevance of the differences. The impact of the difference can be further examined by considering the average difference. Table 4 presents the average difference between male and female Engineering students in the number of credits taken. These differences would indicate, for example, that male students took more credits in upper level and graduate Engineering courses than female Engineering students, while female students took more credits in lower level Engineering courses. With this type of information, the impact of an increase in the number of females can be anticipated, not only in Engineering but also in other areas.

Variable Contribution to Group Differences

Given that a test of hypothesis concerning sex, race, or other student characteristics is statistically significant, further understanding of the course areas which differentiate the groups being tested can be gained through discriminant analysis. In discriminant analysis, a linear discriminant function is determined so that the dependent variables are combined in such a way so as to maximize the discrimination between the groups being compared. The weights that are used to combine the dependent variables into a single function, known as discriminant coefficients, are often used in evaluating the relative contribution of each dependent variable to the discrimination, particularly after they have been standardized with regard to their variances. Comparisons in magnitude of the standardized discriminant function coefficients, regardless of the sign, then indicate one aspect variable contribution. A second perspective on the problem is to analyze each dependent variable univariately and assess whether a particular variable in and of itself contributes solely to the group differences.

Table 4

Differences Between Male and Female Engineering Students

Variable			Average Credits Taken		
Department	School	Level	Male	Female	Difference (Male-Female)
BIOL	NAT SC	LL	0.041	0.000	0.041
BIOL	NAT SC	UL	0.002	0.000	0.002
BUSIN	GEN ST	LL	0.005	0.000	0.005
BUSIN	CAS	UL	0.155	0.349	-0.194
COMPR	NAT SC	LL	0.110	0.000	0.110
COMPR	NAT SC	UL	0.025	0.000	0.025
EDUC	GEN ST	LL	0.003	0.000	0.003
EDUC	CAS	LL	0.024	0.007	0.017
ENGRN	ENGRNG	LL	4.230	4.671	-0.441
ENGRN	ENGRNG	GR	0.278	0.205	0.730
ENGRN	ENGRNG	UL	5.274	4.971	0.303
ARTS	HUMNTS	LL	0.025	0.036	-0.011
ARTS	HUMNTS	UL	0.009	0.000	0.009
ARTS	GEN ST	LL	0.005	0.000	0.005
LANG	HUMNTS	LL	0.018	0.000	0.018
LETTR	HUMNTS	LL	0.092	0.225	-0.133
LETTR	HUMNTS	UL	0.039	0.039	0.000
LETTR	GEN ST	LL	0.002	0.000	0.002
LETTR	CAS	LL	0.170	0.108	0.062
MATH	NAT SC	LL	0.107	0.101	0.006
MATH	NAT SC	GR	0.000	0.010	-0.010
MATH	NAT SC	UL	0.027	0.052	-0.025
MLTRY	ROTC	LL	0.104	0.000	0.104
MLTRY	ROTC	UL	0.071	0.000	0.071
PHY S	NAT SC	LL	3.314	3.410	-0.096
PHY S	NAT SC	UL	0.013	0.042	-0.029
PSYCH	NAT SC	LL	0.011	0.000	0.011
PUB A	GEN ST	LL	0.007	0.020	-0.013
SOC S	SOC SC	LL	0.900	1.153	-0.253
SOC S	SOC SC	UL	0.049	0.121	-0.072
SOC S	CAS	LL	0.007	0.039	-0.032
SOC S	CAS	UL	0.007	0.000	0.007
INTRD	HUMNTS	LL	0.013	0.000	0.013
INTRD	HUMNTS	UL	0.004	0.020	-0.016
INTRD	CAS	LL	0.012	0.020	-0.008
CERT	GEN ST	UL	0.004	0.020	-0.016

While discriminant analyses were conducted for each school, the results of the analysis for Engineering are presented here as an example. Tables 5 and 6 summarize these results. In Table 5, the focus is on the test of hypothesis associated with the student characteristic sex; the univariate F-values and the associated p-values and the standardized discriminant coefficients for each of the course offerings are presented each term. To facilitate interpretation of this data, coefficients of high magnitude are starred, and significant univariate F-values (= 0.0003 0.01/p, where p = number of variables) are indicated with parens. Four types of courses would seem to contribute most to the differences in course taking behavior of males and females: Engineering at both lower and upper levels, Physical Sciences at the lower level, and Social Sciences at the lower level.

This observation holds across the remaining significant tests of hypothesis. Table 6 summarizes the discriminant analyses and significant univariate F-tests for each of the significant multivariate tests for Engineering, and the impact of those four variables in the discrimination of the various groups can be clearly seen.

Engineering: An Illustration

Using the School of Engineering as an example, this study provides the academic planner with relevant information to assist in examining programmatic impacts of changing student bodies. Suppose that the institution decided to recruit female students more actively and to allow enrollment of females in Engineering to increase so that 30% of the undergraduate students were female. At the same time total enrollment would remain at its present level. Enrollment for females would then increase from 307 to 590 an increase of about 280 students.

Table 5

Summary of Univariate F-Tests and Standardized Discriminant Coefficients
Associated with the Test of Hypothesis: Sex (Engineering)

Variable			Univariate	p-value	Standardized Discriminant
Department	School	Level	F-Values	less than	Coefficient
BIOL	NAT SC	LL	1.7632	0.1844	-0.0108
BIOL	NAT SC	UL	0.1843	0.6678	-0.0203
BUSIN	GEN ST	LL	0.3325	0.5643	-0.0062
BUSIN	CAS	UL	4.0728	0.0438	-0.6749
COMPR	NAT SC	LL	3.0874	0.0791	-0.1011
COMPR	NAT SC	UL	0.7301	0.3930	0.0029
EDUC	GEN ST	LL	0.2729	0.6015	-0.0190
EDUC	CAS	LL	1.2988	0.2546	0.0201
ENGRN	ENGRNG	LL	2.2090	0.1374*	-1.8005
ENGRN	ENGRNG	GR	1.5511	0.2132	-0.0558
ENGRN	ENGRNG	UL	1.6891	0.1939*	-1.0668
ARTS	HUMNTS	LL	0.1641	0.6855	-0.2025
ARTS	HUMNTS	UL	0.1843	0.6678	-0.0057
ARTS	GEN ST	LL	0.3696	0.5434	0.0554
LANG	HUMNTS	LL	0.3622	0.5474	-0.0947
LETTR	HUMNTS	LL	3.1505	0.0761	-0.6340
LETTR	HUMNTS	UL	0.0000	0.9978	-0.1945
LETTR	GEN ST	LL	0.1856	0.6667	0.0016
LETTR	CAS	LL	0.4501	0.5025	-0.4825
MATH	NAT SC	LL	0.0127	0.9104	-0.3139
MATH	NAT SC	GR	5.4301	0.0199	-0.2882
MATH	NAT SC	UL	0.4873	0.4853	-0.2824
MLTRY	ROTC	LL	1.9683	0.1608	-0.2437
MLTRY	ROTC	UL	1.6085	0.2049	-0.0820
PHY S	NAT SC	LL	0.2011	0.6540*	-1.2035
PHY S	NAT SC	UL	2.3721	0.1237	-0.2934
PSYCH	NAT SC	LL	1.1120	0.2918	0.0483
PUB A	GEN ST	LL	0.8751	0.3497	-0.1974
SOC S	SOC SC	LL	1.5155	0.2185*	-1.3567
SOC S	SOC SC	UL	2.3243	0.1276	-0.3953
SOC S	CAS	LL	2.6629	0.1029	-0.2894
SOC S	CAS	UL	0.1843	0.6678	-0.0313
INTRD	HUMNTS	LL	1.3050	0.2535	0.0831
INTRD	HUMNTS	UL	3.6164	0.0574	-0.3062
INTRD	CAS	LL	0.0922	0.7615	-0.1622
CERT	GEN ST	UL	1.8427	0.1748	-0.2881

*Coefficients of high magnitude

()Statistically significant at = 0.01/p

Table 6

Summary of Discriminant Analysis Coefficients and Univariate F-Tests for Engineering Tests of Hypothesis

Department	School	Level	Sex	Race	Status	Level	Sex x Race	Sex x Level
			Test of Hypothesis					
BIOL	NAT SC	LL				( )		
BIOL	NAT SC	UL						
BUSIN	GEN ST	LL						
BUSIN	CAS	UL				( )		
COMPR	NAT SC	LL						
COMPR	NAT SC	UL						
EDUC	GEN ST	LL						
EDUC	CAS	LL						
ENGRN	ENGRNG	LL	*	*	(*)	(*)	*	*
ENGRN	ENGRNG	GR				( )		
ENGRN	ENGRNG	UL	*		(*)	( )	*	*
ARTS	HUMNTS	LL						
ARTS	HUMNTS	UL						
ARTS	GEN ST	LL						
LANG	HUMNTS	LL						
LETTR	HUMNTS	LL						
LETTR	HUMNTS	UL						
LETTR	GEN ST	LL						
LETTR	CAS	LL		*				
MATH	NAT SC	LL			( )			
MATH	NAT SC	GR						
MATH	NAT SC	UL						
MLTRY	ROTC	LL						
MLTRY	ROTC	UL						
PHY S	NAT SC	LL	*	*	(*)	(*)	*	*
PHY S	NAT SC	UL						
PSYCH	NAT SC	LL						
PUB A	GEN ST	LL						
SOC S	SOC SC	LL			*	(*)		*
SOC S	SOC SC	UL						
SOC S	CAS	LL	*	(*)			(*)	
SOC S	CAS	UL						
INTRD	HUMNTS	LL						
INTRD	HUMNTS	UL						
INTRD	CAS	LL						
CERT	GEN ST	UL					(*)	

*Coefficients of high magnitude.

()Statistically significant at = 0.01/p

What impact will this change have on the institution's academic programs? The multivariate analysis of variance has shown that sex is an important characteristic in influencing the course taking behavior of Engineering students. Secondly, the discriminant analysis has identified courses taught in Engineering at the lower and upper levels, Physical Science courses taught in the Natural Sciences at the lower level, and Social Science courses taught in the College at the lower level as those which have the greatest influence on the differences observed between males and females. Assuming that the average course taking behavior of both males and females would remain the same, shifts in the credit hours would be observed. Fall term credit hour consumption at the lower level in Engineering courses would increase by approximately 125 credits and decrease at the upper level by 85 credits. In the Physical Sciences, the impact would be less noticeable: credit consumption would increase by 27 credits. For the Social Sciences offered through the College, an increase of only 9 credits could be expected. Through the application of these analytical tools, an academic planner could systematically evaluate the effect of the changes in the composition of the student body for each of the characteristics examined.

SUMMARY

One major purpose of this paper has been to examine the question as to what influences, if any, do student characteristics have on course selection patterns.

(1) Do women select a different distribution of program offerings than men? In examining each of the schools, four of the six schools showed statistically significant differences at the 0.01 level based upon student sex.

Social Work and Health Related Professions were the schools where sex was not identified as a factor influencing course taking behavior.

(2) Does the pattern of course selection for minority students differ from white students? Four of the schools showed a significant difference between course selection patterns between white and minority students. Again, the schools of Social Work and Health Professions were identified as not having race as a factor influencing course selection patterns.

(3) Is there a difference between full- and part-time students in their respective course taking behavior? All schools showed that a difference existed between part- and full-time students relative to the courses selected.

(4) Do differences exist among freshmen, sophomores, juniors, and seniors? With the exception of Social Work, tests of this hypothesis indicated student course taking behavior is differentiated among levels of undergraduates in terms of their course election patterns.

The second purpose of this study has been to present a methodology which extends the typical descriptive analysis of student course taking behavior. The application of multivariate analysis of variance models and discriminant analysis can be seen to be useful tools to the academic planner. While the approach taken in this study has examined course taking behavior at a macro-level, these same tools could be applied so that analyses at the department level within a school could be conducted, giving the academic planner more detailed information about behavior of different student groups.

In a planning framework anticipated shifts in the enrollment pools for a given student major can be translated into impacts on the type and distribution of courses to be selected. And the advantage is that these tools take into account not only the core requirements of a major but also the historical pattern of curriculum electives. Through this type of analysis then, an institution can increase its ability to meet the needs of its anticipated enrollment groups and to align its resources efficiently. Basic characteristics of students: sex, race, status, and level have been shown in this study to influence the course election patterns, and as institutions prepare for the coming decade planning should take into account these factors.

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Summary of Multivariate Analysis of Variance

Education

Hypothesis	Multivariate F-value	Degrees of Freedom	p-value less than
Sex	9.1939	35,372	0.0001*
Race	1.9967	35,372	0.0010*
Status	72.6730	35,372	0.0001*
Level	5.1224	105,1115	0.0001*
Sex x Race	4.6942	35,372	0.0001*
Sex x Status	1.1673	35,372	0.2421
Sex x Level	1.3071	105,1115	0.0248
Race x Status	1.1472	35,372	0.2653
Race x Level	1.3071	105,1115	0.0248
Status x Level	1.4184	105,1115	0.0050*

Summary of Multivariate Analysis of Variance

Engineering

Hypothesis	Multivariate F-Value	Degrees of Freedom	p-value less than
Sex	2.0723	36,1916	0.0003*
Race	1.8360	36,1916	0.0019*
Status	158.2395	36,1916	0.0001*
Level	81.6075	108,5739	0.0001*
Sex x Race	2.1741	36,1916	0.0001*
Sex x Level	1.3865	108,5739	0.0054*
Race x Level	1.3390	108,5739	0.0116

*Statistically significant = 0.01.

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Degrees of Freedom	p-value less than
22,271	0.4751
22,271	0.9321
22,271	0.0001*
44,542	0.0001*
22,271	0.0785
44,542	0.2647

is of Variance

Degrees of Freedom	p-value less than
24,568	0.0001*
24,568	0.0001*
24,568	0.0001*
72,1698	0.0001*
72,1698	0.0001*

Summary of Multivariate Analysis of Variance

Pharmacy

Hypothesis	Multivariate F-value	Degrees of Freedom	p-value less than
Sex	2.9916	19,372	0.0001*
Race	2.6922	19,372	0.0002*
Status	10.2126	19,372	0.0001*
Level	24.4561	57,1110	0.0001*
Sex x Level	1.5994	57,1110	0.0037

Summary of Multivariate Analysis of Variance

Social Work

Hypothesis	Multivariate F-value	Degrees of Freedom	p-value less than
Sex	1.2401	26,108	0.2202
Race	1.5772	26,108	0.0551
Status	15.3502	26,108	0.0001*
Level	1.3635	78,324	0.0340
Sex x Race	0.5241	26,108	0.9994
Sex x Status	0.3184	26,108	0.9754
Race x Status	0.5085	26,108	0.9701

*Statistically significant = 0.01.